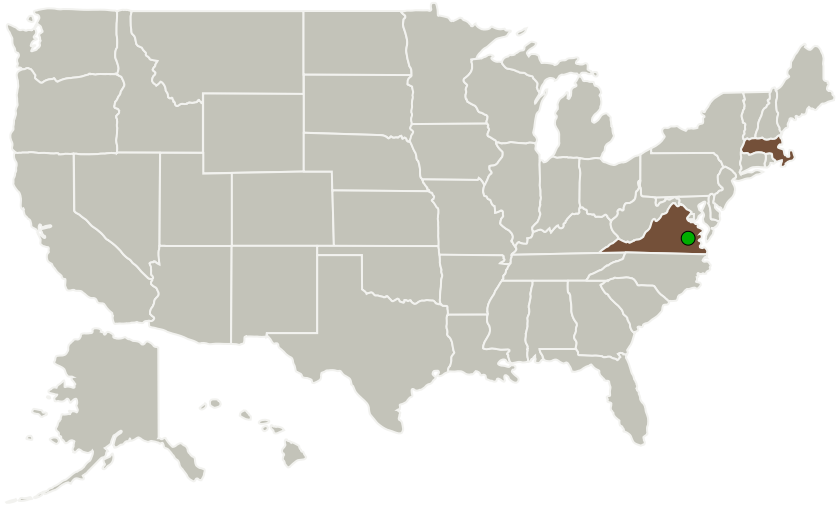
Spatial Heterodyne Spectrometer for Aviation Hazard Detection, Phase I

Completed Technology Project (2014 - 2015)

Project Introduction

Physical Sciences Inc (PSI) proposes the development of a longwave infrared (LWIR) imaging spatial heterodyne spectrometer (I-SHS) for standoff detection of clear air turbulence (CAT) and wake vortices from an airborne platform. PSI will team with Georgia Tech Research Institute (GTRI) who has produced significant research on the application of LWIR hyperspectral imaging for detection of these and other air hazards. The research has produced extensive simulations, however, the predicted spectral radiance signatures are an order of magnitude below the noise floor of state of the art in LWIR hyperspectral imagers. The proposed LWIR I-SHS will offer this order of magnitude improvement in noise equivalent spectral radiance through a combination of high throughput and minimal noise-inducing sampling errors owing to the stationary interferometer. A preliminary systems analysis predicts a per-pixel NESR of 1E-9 W/(cm^2 ster cm^-1) at 16 cm^-1 spectral resolution. In Phase I, PSI will formalize a system performance model and will produce and characterize a breadboard I-SHS which will be used to demonstrate a molecular imaging measurement as a surrogate for a wake vortex. With the support of GTRI, PSI will generate requirements and a conceptual design for a TRL 5 system to be developed in Phase II.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Physical Sciences, Inc.	Lead Organization	Industry	Andover, Massachusetts
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

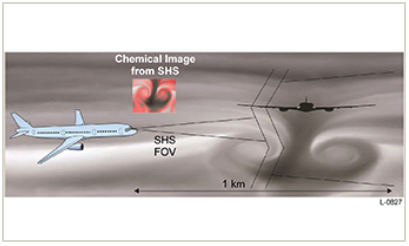
June 2014: Project Start

January 2015: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137520)*

Images



Briefing Chart
Spatial Heterodyne Spectrometer for Aviation Hazard Detection, Phase I
(https://techport.nasa.gov/image/127284)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Physical Sciences, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

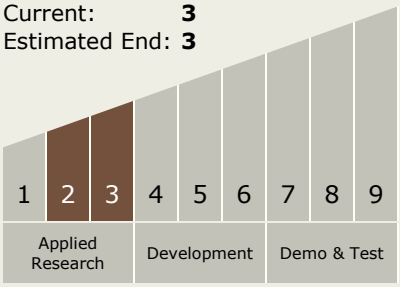
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Julia R Dupuis

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.1 Field and Particle Detectors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System